



SCREENING  
FOR  
GLAUCOMA

A description of eight glaucoma case-finding programs  
conducted prior to February 1957

1959

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## FOREWORD

Glaucoma has emerged as one of the leading causes of blindness in the United States, accounting for 15 percent of all the sight loss occurring today. Factors contributing to this situation have been increased incidence of accidental eye injuries, and the growing number of people in our population annually entering the older age groups which are more susceptible to the disease.

Blindness from glaucoma is preventable if the condition is discovered in its early stages and adequate treatment is instituted. With proper treatment, 80 percent of those diagnosed early will not suffer any further disability. Yet an estimated 2 out of every 100 persons over 40 years old have glaucoma. Most of them do not know they have the condition and are therefore not under proper treatment.

Finding these people with unsuspected glaucoma and bringing them to treatment is imperative, if we are to prevent their becoming blinded unnecessarily. Glaucoma detection programs have been successful in finding cases of the disease early and a variety of methods and techniques have been used in various parts of the country.

The Public Health Service's Chronic Disease Program has prepared this booklet describing methods used and findings reported in eight glaucoma detection programs conducted prior to February 1957, in the hope that it will answer some of the questions asked about programs of this type and help to stimulate new ideas and activities in early case finding.

Inclusion in this publication does not imply Public Health Service approval of the programs described or the methods used. The information presented is intended only to serve as a report of experience in this field that may be helpful to those who are planning glaucoma detection programs.

Wilfred D. David, M. D.  
Chief, Chronic Disease Program

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## SAN FRANCISCO, CALIFORNIA

Date: January 1953 - June 1956.

Places: Eye Clinic, University of California Medical School, and University of California Hospitals; Agnews State Mental Hospital; San Francisco County Hospital; U. S. Veterans Hospital; and ophthalmologists' offices.

Conducted by: Department of Ophthalmology, University of California Medical School.

Sponsored by: National Society for Prevention of Blindness.

Number tested: 7,943.

### ORGANIZATION

A glaucoma detection program, aimed at demonstrating the need for ophthalmologists and all physicians giving general physical examinations to patients over 40 years of age, to include routine tonometry in these examinations, was conducted by the Department of Ophthalmology, University of California. Over two-thirds of the persons tested were private patients of two staff members. Other members of the staff and employees of the Eye Clinic and Hospitals of the University of California assisted in the program. Cooperating hospitals were the San Francisco County Hospital, U. S. Veterans Hospital, and Agnews State Mental Hospital. The program was supported by a grant from the National Society for the Prevention of Blindness.

### TEST POPULATION

Included in this glaucoma detection survey were patients visiting the private offices of two ophthalmologists, inpatients in four hospitals, and patients visiting an eye clinic. All were over 40 years of age, and known glaucoma patients were not tested.

### TEST PROCEDURES

All patients were tested with tonometry and ophthalmoscopy and, when practicable, were also given a test for visual acuity. With the exception of visual acuity tests and some tonometry by nurses, all screening was performed by an ophthalmologist. Standardized Schiøtz tonometers were used. The footplates were cleaned by wiping them with cotton sponges dipped in Zephiran. Pontocaine was the anesthetic used, with no reaction reported.

## RETESTING AND DIAGNOSTIC PROCEDURES

Further testing was indicated on the basis of an intraocular pressure reading of over 25 mm. Hg (Schiotz, 1948), suspiciously deep optic cupping, or shallow anterior chamber. Retests included repeated tonometry with different weights and different tonometers, tonography, visual fields, visual acuity, and water provocative tests.

Criteria established for glaucoma diagnosis were:

1. An abnormally high intraocular pressure (35 mm. Hg Schiotz, 1948)  
plus
2. One other positive finding, e.g.,
  - a. A nerve fiber bundle visual field defect.
  - b. Glaucomatous cupping of the optic disc.
  - c. Below normal facility of aqueous outflow.
  - d. A definitely positive water provocative test.

In the absence of other signs of glaucoma, a patient was classed as a glaucoma suspect if he had a slightly elevated intraocular pressure.

## REFERRAL AND FOLLOWUP

Private patients remained under observation and those having glaucoma were placed under treatment. With the exception of those in Agnews Hospital, many of the hospital patients were not seen after the initial examination. Patients included in the study from the Eye Clinic were followed in the clinic over a period of 6 months.

## DISCUSSION

Over two-thirds of the patients tested in this project were private patients whose cooperation made final diagnosis possible. The rate of previously undetected glaucoma for the entire series of nearly 8,000 patients was found to be very slightly over 2 percent which is consistent with the generally accepted national estimated prevalence of this disease. Fundi of all patients were also examined and it was noted that not a single fundus condition was uncovered that required treatment.

The following advice was offered regarding the general conduct of such a screening project:

"Conduct a thorough complete glaucoma detection program in the shortest possible time. Precede the study with a concentrated public education program. Use tonometry and ophthalmoscopic examinations as prime methods of detection.

The Harrington-Flocks Multiple Pattern Field Screener should be used, if possible. This instrument is easy to operate and offers a rapid and accurate method for detecting visual field defects caused by glaucoma and other diseases."

The chief value of all glaucoma surveys is regarded as educational. The statistics derived from them present the glaucoma problem in convincing terms to the medical profession and to the general public. The latter are made aware of the seriousness of the disease and the necessity for early detection. The ultimate aim should be to persuade the medical leaders that tonometry should be included as part of every physical examination in the over 40 age group.

#### SAN FRANCISCO, CALIFORNIA

	Number	Percent
Total persons screened.....	7,943	100.0
Classified glaucoma or possible glaucoma.....	207	2.6
Previously unknown glaucoma.....	160	2.0
Undetermined classification or patient "lost" .	47	0.6

#### REFERENCES

Correspondence: Daniel G. Vaughan, Ophthalmologist.

Vaughan, Daniel G. Jr.; Shaffer, Robert N.; Asbury, Taylor; Mettier, Stacy R. Jr.; Ridgway, William L.; and Lotspeich, Ruth A.: Glaucoma detection in private practice and hospital. Sight-Saving Rev., 27, 3:145-148, Fall 1957.

Vaughan, Daniel G. Jr.; Asbury, Taylor; Hoyt, William F.; Bock, Rudolph, H.; and Swain, Jean M.: Glaucoma survey of 1,000 hospital patients. Tr. Pacific Coast Oto-Ophth. Soc., 36: 99-105, 1955.



## SOUTHERN CALIFORNIA "G" DAYS

Date: March 1956 - February 28, 1957.

Places: Alhambra, Pomona, Santa Ana, Santa Barbara, Van Nuys, and other places for which data are not available.

Conducted by: California Chapter National Society for Prevention of Blindness in cooperation with local medical societies, health departments, and others.

Sponsored by: Lions Clubs in each area.

Number tested: 3,958 in 5 projects (numerical data not available for others).

### ORGANIZATION

"G" days had been organized and conducted in 9 Southern California communities by the California Chapter of the National Society for the Prevention of Blindness, through February 1957. Several have been held since that time. The general pattern for organization of these projects has been as follows.

Chapter officers took responsibility for publicity, training of volunteers, formation of central committees and subcommittees, and coordination of the entire project. In each community, the Lions Club sponsored the project and underwrote expenses. Approval was obtained from the Professional Advisory Committee of the California Chapter and from the local medical association. Ophthalmologists donated their time and that of their assistants. A committee was formed which included, as a rule, leading representatives of the Lions Club, the California Chapter of the National Society for the Prevention of Blindness, and the local health department. Wives of physicians and Lions Club members were also members of this central committee. Subcommittees of the central committee made arrangements for printing, space, time, equipment, medical supplies, movies (designed both to entertain and instruct persons waiting for tests), assignments for volunteer workers before, during, and after "G" day, and other details. In some communities the entire chapter of the Delta Gamma Sorority, whose main project is prevention of blindness, volunteered to assist whenever or wherever needed.

Publicity was limited to 1 week before "G" day in each city as it was felt that concentration would be more effective than publicity extended over a prolonged period of time. Newspapers carried articles and editorials. There were spot announcements on radio, and, in some instances, a discussion of glaucoma by ophthalmologists on radio and television. There were talks before civic, church, and other groups. Public assistance offices in the community were furnished with multigraphed invitations to their clients over 40.

## TEST POPULATION

The general population in each area over 40 years of age was invited to participate in these projects. No persons were admitted for screening who were already under treatment for glaucoma.

## TEST PROCEDURES

Screening procedures routinely included an external examination for gross abnormalities, ophthalmoscopic examination of fundus, and a tonometer test, all performed by an ophthalmologist. All persons with suspicious findings on one of these tests and as many others as possible were screened for visual field loss with the Harrington-Flocks Multiple Pattern Screener. Technicians or trained volunteers gave visual field screening tests, and optometrists or trained volunteers gave visual acuity tests. Tonometers in use were either Schiøtz or McLean. The footplates were cleaned with Zephiran. Pontocaine was the anesthetic, with very little adverse reaction reported.

## RETESTING AND DIAGNOSTIC PROCEDURES

No retesting was included in these surveys, and diagnosis was not made except in a few advanced cases. Persons requiring a complete examination were referred to private physicians on the basis of one of the following:

1. Suspicious fundus findings as per ophthalmologist's recommendation.
2. Intraocular pressure reading of over 25 mm. Hg (Schiøtz) or intraocular pressure reading of over 40 mm. Hg (McLean).
3. Reduced fields when screened with Harrington-Flocks Multiple Pattern Screener.

## REFERRAL AND FOLLOWUP

Negative screenees were informed of test results at the time of screening. Positive screenees were informed either at time of screening or by letter. In general, arrangements were made for a second examination in an ophthalmologist's office to confirm the "G" day findings. Those referred received stamped, addressed cards to give to their physicians who were instructed to fill them out regardless of findings, and return them to addressee - the California Chapter, National Society for Prevention of Blindness, or local health officer.

## DISCUSSION

"G" days in California were patterned after the Cleveland Survey (p. 16). It was felt that a modified version of this plan would be worthwhile, if only from an educational standpoint.

The project succeeded in its primary purpose of creating among the general public an awareness of the problem of glaucoma and a realization of the need for early detection. This was evidenced by reports of the ophthalmologists in each area that, following "G" day, they saw a lot more glaucoma in their private practice.

Results of these "G" days in California communities lend support to previous estimates of glaucoma prevalence and emphasize the need for continuing efforts to reach all those in our population over 40 years of age. Glaucoma was diagnosed in about 1.5 to 7 percent of the total persons screened, with the higher percentage probably due to a median age of 63 among those screened in Santa Barbara.

## SOUTHERN CALIFORNIA

### "G" Days

Conducted by California Chapter, National Society for Prevention of Blindness  
March 1956 to February 1957<sup>a</sup>

Place	Total screened	Total referred for further tests for glaucoma <sup>b</sup>	Results of diagnosis and followup	
			Diagnosed glaucoma <sup>b</sup>	Followup incomplete
Alhambra.....	881	46	8	18
Pomona .....	823	74	11	23
Santa Ana.....	1,023	100	21	50
Santa Barbara.....	682	158	47	0
Van Nuys .....	549	48	11	19
Total persons ...	3,958	426	98	110

<sup>a</sup> Figures apply to 5 "G" days named above. Four other "G" days including 2 at Glendale were conducted by the California Chapter of the National Society for the Prevention of Blindness during this time period, but numerical data are not available. Also during the same time period, the Santa Barbara County Medical Society sponsored a similar case-finding project in Lompoc, and the ophthalmologists in Bakersfield held a glaucoma screening project at the Kern County Fair. Since Feb. 1957 several additional projects have been held.

<sup>b</sup> Includes some persons with previously diagnosed glaucoma who were not under treatment at the time.

## REFERENCES

Correspondence: Mrs. Burnetta Downing, Executive Director, California Chapter of the National Society for the Prevention of Blindness.

H. and Downing, Burnetta: Community-wide glaucoma case finding. 82, Summer 1957.

## LOUISIANA and MISSISSIPPI

Date: February 1952 - April 1954.

Places: Iberia Parish, La.; and Marion County and Holmes County, Miss.

Conducted by: Department of Ophthalmology, School of Medicine, Tulane University, New Orleans, La.

Sponsored by: National Society for Prevention of Blindness, Louisiana and Mississippi State Boards of Health, W. K. Kellogg Foundation.

Number tested: 30,667 for visual defects.

### ORGANIZATION

A survey for all types of visual defects in two rural counties of Mississippi and a rural parish of Louisiana was the first of its type ever conducted. It was inspired by frequent comments in the press, on the radio, and in government reports about deficiencies in medical care throughout rural America and particularly in the Southern States. Interested in good eye care, the Department of Ophthalmology of Tulane University School of Medicine proposed and conducted this project to discover the extent of the need for ophthalmic services in nearby rural areas. Sponsored by the National Society for the Prevention of Blindness and the Mississippi and Louisiana State Boards of Health, the project was financed by a grant from the Kellogg Foundation. The Visual Research Division of the American Optical Company loaned A. O. Sight Screeners and provided forms for recording results.

Conferences were held before the survey began and at intervals, thereafter, with local public health personnel, including health educators, and interested lay persons. The program was carefully explained to members of the medical profession in the areas to be surveyed. Local physicians experienced in treating eye, ear, nose, and throat conditions served as consultants in some problem cases and ophthalmologists from nearby cities, in others. There were no certified resident ophthalmologists in the three counties.

A public health coordinator preceded the arrival of the mobile examining unit in the areas to be surveyed. Posters and handbills describing the purpose of the survey and announcing the time and place of the tests were distributed. The coordinator gave talks before civic and religious groups and in schools, as well as over local radio stations. Churches and schools cooperated in advertising the endeavor and in lending space for part of the work.

### TEST POPULATION

This overall ophthalmic survey was carried out over a 2-year period upon a considerable proportion of the total population of three predominantly rural

counties of the Delta area. Both white and nonwhite persons were included. More than half of those whose eyes were examined were under 20 years of age; and the proportions in the older age groups were relatively low. Routine tonometer tests, performed for a time in Holmes County, were limited to persons over 40 years of age.

### TEST PROCEDURES

During the course of this survey, procedures varied considerably. Visual acuity tests were given by technicians using the A. O. Sight Screener. Persons showing any failure or hesitation in passing the screening test were referred to the ophthalmologist even though visual acuity might be 20/20. Persons showing any abnormality about the eyeball or lids were likewise referred for further examination. Schiøtz tonometry was performed on 699 adults in Holmes County. In other areas, because of limitations, tonometric measurements were taken only when indicated.

### RETESTING AND DIAGNOSTIC PROCEDURES

Any person whose test was not completely normal was referred to the project ophthalmologist, who performed the following tests: visual acuity test with Snellen chart, refraction, motility test, ophthalmoscopy, slit lamp, external ocular examination, and tonometry, when indicated. Since it was difficult to have patients return for a second examination, diagnosis was usually made at the time of the first visit. Questionable cases, however, were reviewed and discussed with the consultant ophthalmologist on his weekly visit to the unit.

### REFERRAL AND FOLLOWUP

When the examination was completed, each person's card was returned to the area health department for followup. A public health nurse visited each person who had shown any abnormality. Some were referred to private ophthalmologists. The ultimate success of followup of those persons found as a result of the survey to be in need of further attention is not known. In the areas surveyed, there was almost complete lack of specialized ophthalmic care. A high percentage of the people screened were from rural areas which made followup more difficult.

### DISCUSSION

Glaucoma detection was only a minor part of the work of this survey, which is reported to be one of the most extensive surveys of visual defects ever conducted. The major objective of the survey was to identify eye abnormalities in general among the population and to provide a basis for similar ophthalmic work in other rural areas.

The purposes of the survey as outlined were essentially sixfold:

1. To prevent blindness by recognition of incipient cases and by referral of the person involved to proper diagnostic and therapeutic facilities.

2. To determine the prevalence of eye defects in the sample area.
3. To permit an estimate of the type and amount of eye care needed for the general population of these and similar areas of the country.
4. To disseminate the information thus secured to training centers.
5. To secure criteria for an evaluation of present educational programs for the training of specialists in the care of eye defects and diseases.
6. To permit the formulation of an intensive visual conservation program which, though designed specifically for these areas, might be extended to the country at large.

The use of a mobile testing unit to screen for and diagnose visual defects in a rural population was demonstrated. Extensive trial of methods and procedures used, with number and type of defects found, was reported. A basis was laid for estimating prevalence of eye defects and amounts and types of eye care needed in these and similar communities. The principal recommendation was that similar surveys be conducted elsewhere in the country.

#### IBERIA PARISH, LOUISIANA AND HOLMES AND MARION COUNTIES, MISSISSIPPI

	Number	Percent
Total persons screened for eye defects .....	30,667	100.0
Persons with visual defects (excluding presbyopia in persons 40 years of age and over).....	5,105	16.6
Persons found to have glaucoma .....	75	0.2
Persons with previously undiagnosed glaucoma	52	0.2

#### HOLMES COUNTY, MISSISSIPPI

Persons 40 years of age and over<sup>a</sup>

	Number	Percent
Persons screened for eye defects.....	<sup>a</sup> 2,078	100.0
Persons classified as having glaucoma .....	44	2.1

<sup>a</sup> Of this group, 699 had tonometry tests in screening.

## REFERENCES

Correspondence: William B. Clark, Professor of Ophthalmology, School of Medicine, Tulane University of Louisiana.

Clark, W. B.: An ophthalmic survey of sample populations in Mississippi and Louisiana. *Sight-Saving Rev.*, 26, 3:132-137, Fall 1956.

Clark, W. B.; Bancroft, Huldah; Allen, J. H.; and Wang, Y. L.: Incidence of visual defects in two rural counties of Mississippi and a rural parish of Louisiana. (Processed.)

## NEW JERSEY

Date: February 1954 (1 week) and September 1955 (1 week).  
Place: State of New Jersey.  
Conducted by: Eye Health Service, New Jersey State Commission for the Blind.  
Sponsored by: State Medical Society and State Ophthalmological Society.  
Number tested: 4,975.

### ORGANIZATION

The New Jersey project was the first Statewide glaucoma screening project to be attempted in the United States. Conducted by the Eye Health Service of the New Jersey State Commission for the Blind, it was sponsored by the State Medical Society and State Ophthalmological Society. During February 1954, 26 hospitals and, in September 1955, 58 hospitals made available the facilities of their eye clinics for screening purposes. Newspapers, radio, and television stations cooperated by donating time and space. Ophthalmologists prepared news releases about glaucoma and about the screening projects. Street car and bus cards, posters, leaflets, movie shorts, and talks before civic, church, and other groups also publicized the program. The Eye Health Service sent notices to Visiting Nurse Associations, public health nurses, school nurses, and Parent Teachers Associations throughout the State. Social workers at hospitals were asked to encourage people attending other health clinics to have the screening tests.

### TEST POPULATION

Anyone over 40 years of age desiring glaucoma screening was accepted at any of the participating hospitals.

### TEST PROCEDURES

Screening tests were done in outpatient departments of hospitals by private ophthalmologists and included the following: external examination for gross abnormality, ophthalmoscopic examination of fundus, visual acuity, and intraocular pressure tests. The tonometers used were Schiøtz, the footplates being cleaned by using Zephiran on cotton. Pontocaine was the anesthetic and there were no adverse reactions.

### RETESTING AND DIAGNOSTIC PROCEDURES

Retesting was indicated when the findings showed glaucomatous optic atrophy, intraocular pressure of 29 mm. Hg or above (1948 chart) or a shallow anterior



chamber. Individual procedures for retesting and diagnostic procedures were set up by each hospital clinic in agreement with the ophthalmologist serving that clinic.

#### REFERRAL AND FOLLOWUP

All persons were notified of test results at the time of the screening. Home visits by a public health nurse of the Commission for the Blind were arranged for those who had or were suspected of having glaucoma. These visits provided an opportunity for the nurse to explain to the patient the nature of the disease emphasizing the importance of a complete examination and of continued treatment to prevent blindness. Arrangements were made for complete eye examinations at the office of an ophthalmologist or eye clinic, as a private, part-pay, or free patient.

#### DISCUSSION

About 10.7 percent of the number of persons tested in this project were reported as being glaucoma suspects. Although followup of all such persons was an important part of this program, no figures are available on the number of glaucoma cases diagnosed as a result of this project.

Glaucoma screening projects to be of real value must include followup of all persons screened positive. In New Jersey, glaucoma and possible glaucoma patients from hospital clinics and ophthalmologists' offices, as well as from screening programs are visited in their homes by a nurse. She may be either a public health nurse from the Eye Health Service or a visiting nurse under the direction of the Eye Health Service, State Commission for the Blind. Her duties are to:

- a. Discuss glaucoma with patient and with family.
- b. Discuss the importance of a complete medical eye examination by an ophthalmologist, either as a private case or a clinic case.
- c. Assist patients in availing themselves of more intensive examinations.
- d. Assist with financial problems and transportation.
- e. Make family aware of seriousness of the disease and the importance of treatment in order to control further loss of vision.
- f. Instruct family to have patient in a quiet environment in order to assist in keeping tension down.
- g. Teach proper methods of instilling eye drops.
- h. Follow patient always, either through ophthalmologist's office or eye clinic as to patient's regular attendance.
- i. Acquaint patient of other services available, such as medical examination and tests at local hospitals, Commission for the Blind, Red Cross, and other agencies.

The New Jersey State Medical Society in 1957 organized a Statewide glaucoma detection program following the pattern originated by the Eye Health Service of the Commission for the Blind. At their request the Eye Health Service cooperated with them in the followup of cases uncovered at that time. The medical society held another Statewide glaucoma detection program in September 1958.

#### NEW JERSEY

	Number	Percent
Total persons screened .....	4,975	100.0
Classified glaucoma or possible glaucoma..	534	10.7

#### REFERENCE

Correspondence: Mrs. Emma Howe, Director, Eye Health Service, New Jersey State Commission for the Blind.

## KINGS PARK, NEW YORK

Date: January 1955 - August 1955.

Place: Kings Park State Hospital.

Conducted by: Glaucoma Research Project of the Ophthalmological Foundation Inc., New York, N. Y.

Sponsored by: New York State Department of Mental Hygiene and Kings Park State Hospital, Kings Park, N. Y.

Number tested: 6,373

### ORGANIZATION

The Kings Park State Hospital Survey was conducted under the auspices of the Glaucoma Research Project of the Ophthalmological Foundation, Inc., acting as the national research division of the New York Association for the Blind. Cooperating agencies were the Department of Mental Hygiene of New York State and Kings Park State Hospital. Screening and diagnostic tests were performed by a temporary staff ophthalmologist and nurses of the Kings Park State Hospital, under the general direction of a consulting ophthalmologist. Other members of the staff and most of the patients cooperated without any organized distribution of information materials or publicity. All patients who could be expected to be reasonably cooperative received an administrative order to report for the tests.

### TEST POPULATION

The entire patient population in the State Mental Hospital at Kings Park, N. Y., was tested, where cooperation was possible. It was found that approximately 70 percent of the total population was able to cooperate. There were no age limits. Known glaucoma patients were not given screening tests but were included in followup testing.

### TEST PROCEDURES

Intraocular pressure tests were done with the Berens-Tolman Ocular Hypertension Indicator by nurses trained in the use of this instrument. The nurses operated under the supervision of the ophthalmologist in charge who checked their findings with a standardized Schiøtz tonometer. This was done because of the importance of this large survey and to get the benefit of further validation of the Ocular Hypertension Indicator. The screening findings were consistent with both instruments. Patients whose pressure warranted a more definitive examination were subsequently reexamined by the ophthalmologist using the Schiøtz tonometer. Persons with ocular tension in Schiøtz tonometry of three scale units (27.1 mm. Hg, 1948 conversion chart or 24.1 mm. Hg, 1954 chart) received additional tests

performed by the ophthalmologist. These tests included an external examination for gross abnormality, ophthalmoscopic examination of fundus, visual acuity test, and another Schiøtz tonometer test. The tonometer footplates were dipped in ether, then irrigated with sterile water. Dorsacaine was the anesthetic used, with no adverse reactions observed.

#### RETESTING AND DIAGNOSTIC PROCEDURES

Further examinations were given as the result of abnormal fundusoscopic findings or of a second intraocular pressure reading greater than 26.2 mm. Hg (1954 chart). Persons suspected of having glaucoma were given repeated tonometer tests. A few were given a provocative test (water drinking). To confirm diagnosis, repeated pressure measurements were made using the Schiøtz tonometer.

#### REFERRAL AND FOLLOWUP

Since this was an intrahospital survey, referral and followup procedures were handled locally. Results of screening tests were recorded on patient case cards to become a part of the hospital records.

#### DISCUSSION

About 6.7 percent of those examined in the original screening were classified as glaucoma suspects. Diagnostic tests reduced this proportion to 2.4 percent of the total, the others being classified as false-positives.

Time studies made during this project indicate that at most one doctor can screen 100 patients in 8 hours, with 75 the normal average. Therefore, in view of the relative scarcity of ophthalmologists, the services of general practitioners and nurses are most essential if any large numbers of persons are to be screened.

#### KINGS PARK, NEW YORK

	Number	Percent
Total persons screened .....	6,373	100.0
Persons referred for followup tests.....	424	6.7
Followup and diagnostic results		
Persons lost to followup .....	23	0.4
Persons with followup tests .....	401	6.3
Previously unknown glaucoma .....	156	2.4

#### REFERENCE

Correspondence: Charles Buckman, Director, Kings Park State Hospital, and Charles P. Tolman, Director, Glaucoma Research Project, The Ophthalmological Foundation, Inc., New York, N. Y.

## CLEVELAND, OHIO

Date: November 4, 1953.

Place: Cleveland, Ohio.

Conducted by: Cleveland Society for the Blind and Cleveland Ophthalmologists.

Sponsored by: Citizens Advisory Committee, hospitals contributing space, Hanna Fund, Cleveland Foundation, and others.

Number tested: 12,825.

### ORGANIZATION

An Executive Committee, composed of representatives of the Cleveland Society for the Blind and oculists of the City, was responsible for the working management of the survey. To secure a broad base of community interest, responsibility, and help, a Citizens Advisory Committee was established. The Hanna Fund and the Cleveland Foundation provided financial support. Sixteen hospitals contributed space, 59 ophthalmologists gave their services, and 250 women volunteers were organized to perform the clerical work and to assist the doctors. Members of the Committees were responsible for the educational part of this project. All available means of publicity were employed. The story of glaucoma was told in plain language in newspapers (including neighborhood and foreign language newspapers). Interviews with ophthalmologists and other volunteers were broadcast on radio and television. There were talks before civic, church, and other groups by ministers and other interested citizens. Posters were placed in street cars and buses. Announcements on radio, television, and public address systems in industrial plants reminded people of "G" day.

### TEST POPULATION

As many as possible of the thousands who came to Cleveland hospitals in response to the extensive citywide publicity campaign directed at persons 40 years of age and over were screened.

### TEST PROCEDURES

All tonometry was performed by ophthalmologists. Ophthalmoscopic examinations of the fundus were also planned, but because of the crowds at the testing centers this procedure was followed in only a limited number of cases. Schiøtz and McLean tonometers were used. Footplates were cleaned with a solution of Aqueous Zephiran. Pontocaine was used as the anesthetic. No adverse reactions were reported.

## RETESTING AND DIAGNOSTIC PROCEDURES

No retesting or diagnostic procedures were included in the project. Need for referral for retesting was indicated on the basis of an intraocular pressure of 30 mm. Hg (Schiotz), 40 mm. Hg (McLean), or higher (1948 charts).

## REFERRAL AND FOLLOWUP

Except in urgent cases, no information was given to the patient at the time of the test. In each case of suspected glaucoma the individual was informed by mail that a thorough examination by an eye physician or hospital clinic was indicated. A card was enclosed for reporting by the oculists and for clinic findings. Letters were also sent to ophthalmologists and eye clinics in Cleveland regarding screenees who had reported or who might report to them, and, in some instances, telephone calls were made to both the patient and his ophthalmologist. Followup letters were sent after 3 months and, again, after 5 months, if no report of final diagnosis was received.

## DISCUSSION

The need for a continuing year-round program of glaucoma detection rather than a 1-day mass survey is emphasized in a 1954 report of the Cleveland Survey. Accurate testing was impeded by an unexpectedly heavy response to the presurvey campaign which forced the elimination of fundus tests in the larger number of cases. Overall results, however, closely approximated previous findings of the more systematic Philadelphia Survey. There was an undetected glaucoma rate of nearly 2 percent reported in the Cleveland Survey.

The specific objective of the Cleveland Survey, which was to find as many persons with glaucoma as possible, was attained with the identification of 240 previously unknown cases.

As a result of this Survey, the people of Cleveland were made aware of glaucoma, and for a reasonably long period of time continued to ask their doctors to determine whether or not they had glaucoma.

As a result of the experience gained during the Survey, the following suggestions were made for the conduct of future surveys:

1. The examination should be done by appointment so as to prevent haste on the part of the examiner and an increase in nervousness on the part of the examinee who may be kept waiting an undue length of time.
2. If the test is done by an oculist, the Schiotz tonometer should be employed with the use of two different weights.
3. The tonometers can be sterilized by placing the end in Aqueous Zephiran Chloride 1:5000, or by use of one of the available ultraviolet sterilizers. Sufficient time must be allowed between tests for effective sterilization.

4. The local anesthetic most suitable is Dorsacaine 0.4 percent. This preparation is rapidly effective, produces a minimum of allergic reactions, and its action disappears more rapidly than any other anesthetic. Its one drawback is its cost which is about three times that of the more commonly used Pontocaine solution.

5. If the control of glaucoma through early detection is to be achieved, this condition must be searched for by more than the small group of trained oculists in this country. Tests for glaucoma should be included in every complete physical examination carried out by the internist, the industrial physician, the general practitioner, and even the intern in the hospital.

6. The program to keep people interested in the early detection of glaucoma should be a year-round one.

#### CLEVELAND, OHIO

	Number	Percent
Total persons screened .....	12,825	100.0
Persons referred for followup tests .....	1,635	12.7
Followup and diagnostic results		
Persons lost to followup .....	284	2.2
Persons with followup tests .....	1,351	10.5
Previously diagnosed glaucoma.....	23	0.2
Previously unknown glaucoma .....	240	1.9
"Undetermined" classification .....	23	0.2

#### REFERENCES

Correspondence: Benjamin J. Wolpaw, Ophthalmologist, and Allen W. Sherman, Director, Cleveland Society for the Blind.

Wolpaw, Benjamin J. and Sherman, Allen W.: The Cleveland Glaucoma Survey. Sight-Saving Rev., 24, 3:139-144, Fall 1954.

## PHILADELPHIA, PENNSYLVANIA

Date: 1944 - 1950.

Place: Philadelphia, Pa.

Conducted by: Philadelphia Committee for Prevention of Blindness.

Sponsored by: Philadelphia Committee for Prevention of Blindness, National Society for Prevention of Blindness, and U. S. Public Health Service.

Number tested: 10,000.

### ORGANIZATION

The Philadelphia glaucoma case-finding project was conducted by the Philadelphia Committee for the Prevention of Blindness with the sponsorship of the National Society for Prevention of Blindness. In fiscal year 1950, when a large majority of the patients were screened, the project was supported in part by the U. S. Public Health Service. Methods of organization developed industry by industry, over a period of time, along the following general pattern.

The Executive Director of the Committee discussed plans for individual projects with executives, personnel directors, and union leaders in factories, stores, and government offices. She obtained agreements from those interested regarding: use of health facilities or, in a few instances, the temporary installation of such facilities for screening purposes; publicity to be conducted among the workers; official leave for persons assisting in publicity and those taking tests. In some instances, the Executive Director also secured financial contributions.

Talks to employee groups were made in some cases by executives and in others by union leaders or other employee representatives. Reminders of the availability of screening tests were posted and circulated. Methods used varied according to suggestions made by persons within the industry.

### TEST POPULATION

Screenees were employees of 27 factories, stores, and government installations, and included 215 shoppers screened as a demonstration in a department store. Known glaucoma patients and persons under 40 years of age were not screened.

### TEST PROCEDURES

Test procedures included an external examination for gross abnormality, ophthalmoscopic examination of the fundus, especially of the appearance of the



optic nerve and gross lesions, and an intraocular pressure test. These tests were performed by an ophthalmologist. Standardized Schiøtz tonometers were used. The footplates were wiped with cotton dipped in Zephiran. Tetracaine was the anesthetic and there were no adverse reactions reported. A visual acuity test was given by a nurse.

#### RETESTING AND DIAGNOSTIC PROCEDURES

Those with tonometric readings of 25 mm. Hg or more (1948 chart) were scheduled for further tests at the headquarters clinic of the Philadelphia Committee for Prevention of Blindness. Diagnostic procedures consisted of tonometric studies at different times of the day, with different weights, with or without hydrobromide instillation, water provocative test of Marx, darkroom test, and visual field studies.

#### REFERRAL AND FOLLOWUP

Negative screenees were notified of test results by letter. Positive screenees were informed at the time of screening if immediate treatment was indicated. Otherwise, they were notified by telephone or letter and asked to report for further testing. After retesting, those diagnosed as having glaucoma were referred, with a report of findings, to their own eye physicians or to glaucoma clinics. Some borderline patients were reexamined every 6 months at the Committee headquarters clinic, and others were recalled once a year. Persons with negative test results but with history of glaucoma in the family were kept under observation.

#### DISCUSSION

This project was the first mass glaucoma case-finding project to be reported in detail. At the close of the survey, 1.5 percent of the people originally screened had diagnoses of definite glaucoma and 0.7 percent were classified as "borderline." The prevalence of undiscovered glaucoma in the age group 40-64 years was found to be 1.5 percent. An estimate of 2.0 percent prevalence of glaucoma among persons, 40 years of age or more, which has been based on these figures took into consideration that very few persons over 64 years of age were included in this working group.

In a review of the project the following observation was reported: ". . . optic nerve variations were so frequent that the appearance of the nerve was of no value in terms of early diagnosis of glaucoma." It was concluded that multiple tonometric readings provide more information than fundus appearance.

The results of this study support the contention that the practice of routine tonometry on all persons past the age of 40 is the easiest and most accessible method for detecting glaucoma.

In order to reach large groups of persons for eye examination two methods were suggested: (1) The organization of mass screening in industry, possibly coincident with routine physical examination, (2) The creation of a specialized

agency approved by the local county medical society, which would devise plans for mass screening to discover persons afflicted with or suspected of having glaucoma. This agency would coordinate medical, clinic, public health and social welfare services, and other community resources to make effective the ophthalmologist's recommendation for observation and treatment.

### PHILADELPHIA, PENNSYLVANIA

	Number	Percent
Total persons screened .....	10,000	100.0
Persons referred for followup tests .....	1,234	12.3
Followup and diagnostic results		
Persons lost to followup .....	19	0.2
Persons with followup tests .....	1,215	12.2
Previously diagnosed glaucoma .....	3	<sup>a</sup> 0.0
Previously unknown glaucoma .....	150	1.5
No glaucoma .....	991	9.9
Borderline classification .....	71	0.7

<sup>a</sup> Less than 0.05 percent.

### REFERENCES

Correspondence: Solomon S. Brav, Ophthalmologist.

Brav, S. S. and Kirber, H. P.: Mass screening for glaucoma. J.A.M.A., 147, 12:1127-1128, Nov. 17, 1951.

Carpenter, E. M.; Brav, S. S.; and Seidel, V. I.: Experiment in glaucoma case finding. Am. J. Ophth., 33, 4:611-615, April 1950.

Hankla, Emily K.: Glaucoma case finding in Philadelphia. Pub. Health Rep., 68, 11:1059-1064, Nov. 1953.

## RICHMOND, VIRGINIA

Date: December 1949 - August 1950.

Place: Richmond, Va.

Conducted by: Richmond City Health Department, Richmond Area Community Council, and the U. S. Public Health Service.

Sponsored by: Richmond Academy of Medicine, Medical College of Virginia, and voluntary agencies.

Number tested: 6,020.

### ORGANIZATION

The Richmond City Health Department conducted this multiple screening project in cooperation with the State Health Department, the U. S. Public Health Service, and the Richmond Area Community Council. It was sponsored by the Richmond Academy of Medicine, Medical College of Virginia, and voluntary health agencies. The City Health Department was responsible for a citywide publicity campaign carried on through newspapers, radio, and other informational media.

### TEST POPULATION

Screenees consisted of a nearly 20 percent sampling of participants in the multiple screening program. They included shoppers and employees of two large department stores, workers in industries, and students. All persons were 15 years of age and over. Known glaucoma patients were included in the study.

### TEST PROCEDURES

Tests for measurement of intraocular pressure and visual acuity were given to approximately every sixth person in the overall project. Tonometry was performed by technicians supervised by an ophthalmologist. Schiøtz tonometers, which were calibrated prior to the project, and frequently checked against each other, were used. Sterile water was used to wipe off footplates after each test. Patients with any sign of inflammation of cornea were not tested. Pontocaine was the anesthetic, with no adverse reactions reported.

### RETESTING AND DIAGNOSTIC PROCEDURES

No retesting or diagnostic procedures were used in connection with this project. Basis for referral of a glaucoma suspect was a tonometer reading of 25 mm. Hg (Schiøtz) or higher, in either eye (1948 chart).

## REFERRAL AND FOLLOWUP

All screenees were notified of test results by postcard. Positive screenees were advised to consult a physician. Letters were sent to physicians with a return form to record findings of these followup visits.

## DISCUSSION

The principal location of the screening line operated selectively not only in attracting a large proportion of women, but also in drawing from a relatively high economic and educational level. It was also found that publicity media used failed to attract the lower socioeconomic groups, and that those screened were not a representative sample of the city population.

The abnormally high proportion of screened positives in this test (23.8 percent of the total examined) might be attributed to use of a special chair. This chair was flipped back into a reclining position for the test and this sudden maneuver may have increased pressure sufficiently to have been responsible for the high level of abnormal screening. Use of a high bed rather than a reclining chair was recommended for future projects.

A somewhat greater frequency of high tonometer readings among persons with little formal education may have resulted from a similar condition of tension, induced by fear of the test itself.

As a result of this project it was recommended that: (1) Glaucoma screening should be followed by more definitive tests to minimize false-positive results. (2) In any program involving indigent and low economic groups, facilities for definite diagnosis before referral for treatment should be developed as part of the program.

## RICHMOND, VIRGINIA

	Number	Percent
Total persons given tonometer test .....	6,020	100.0
Persons with pressure of 25 mm. Hg (Schiotz) or higher in one or both eyes .....	1,432	23.8
Persons with pressure of 40 mm. Hg (Schiotz) or higher in one or both eyes.....	237	3.9

## REFERENCE

Correspondence: Edward M. Holmes, Jr., former Director, Department of Public Health, Richmond, Va.